

WE CLAIM:

~~Claims~~

1. Method for producing a composite material from a particulate foam of thermoplastic material, and at least one layer connected thereto by heating the pre-foamed particles to a temperature in the region of the melting temperature and connecting them together to form a molded body and simultaneously or subsequently connecting to the layer, characterized in that a particulate foam of polyalkylene terephthalate, or a blend of polyalkylene terephthalate, having a low crystallite portion in an otherwise amorphous phase is used, and that the particulate foam is tempered, when forming the molded body, when forming the composite with the layer, and/or subsequent thereto, at a temperature converting the amorphous phase into an increased overall crystallite portion.
2. Method according to claim 1, characterized in that the particulate foam is formed into the molded body using pressurized hot vapor and the pressure or the pressurizing time for tempering the particulate foam is controlled.
3. Method according to claim 1 or 2, characterized in that the molded body is further tempered after production.
4. Method according to any one of the claims 1 through 3, characterized in that the molded body is slowly cooled after production.

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5. Method according to any one of the claims 1 through 4, characterized in that the temperature during tempering is controlled by a DSC measurement.
6. Composite material, consisting of a molded body of a particulate foam and at least one layer connected to the molded body, produced in accordance with the method according to any one of the claims 1 through 5, characterized in that the particulate foam (2) consists of a polyalkylene terephthalate or a blend of polyalkylene terephthalates.
7. Composite material according to claim 6, characterized in that the particulate foam (2) consists of polyethylene terephthalate (PET).
8. Composite material according to claim 6 or 7, characterized in that the particulate foam comprises synthetic and/or natural reinforcing fibers.
9. Composite material according to any one of the claims 6 through 8, characterized in that the layer connected to the particulate foam (2) is a cover layer (3) forming the visible side.
10. Composite material according to claim 9, characterized in that the cover layer (3) is a foil of at least one thermoplastic polymer.

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11. Composite material according to claim 9, characterized in that the cover layer (3) comprises a textile structure.
12. Composite material according to any one of the claims 9 through 11, characterized in that the cover layer (3) consists of polyalkylene terephthalate, in particular PET, or a blend of polyalkylene terephthalates.
13. Composite material according to any one of the claims 9 through 12, characterized in that the cover layer (3) is welded to the particulate foam (2).
14. Composite material according to any one of the claims 9 through 12, characterized in that the cover layer (3) is coated onto the particulate foam (2).
15. Composite material according to any one of the claims 6 through 14, characterized in that an intermediate layer (4) of fibers is disposed between the cover layer (3) and the particulate foam (2).
16. Composite material according to claim 15, characterized in that the intermediate layer (4) is a fiber mat, cloth, tissue, knitted fabric or knits.
17. Composite material according to claim 16 or 17, characterized in that the fibers of the intermediate layer

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consist of polyalkylene terephthalate, in particular PET, or a polyalkylene terephthalate blend.

18. Composite material according to any one of the claims 15 through 17, characterized in that the intermediate layer (4) comprises synthetic and/or natural reinforcing fibers.
19. Composite material according to any one of the claims 15 through 18, characterized in that the intermediate layer (4) is welded to the particulate foam (2).
20. Composite material according to any one of the claims 15 through 19, characterized in that the intermediate layer (4) is welded to the cover layer (3).
21. Composite material according to any one of the claims 15 through 20, characterized in that the cover layer (3) is laminated onto the intermediate layer (4).
22. Composite material according to any one of the claims 15 through 21, characterized in that the intermediate layer (4) is a mixed fiber layer containing a portion of fibers of polyalkylene terephthalate, in particular PET, which are welded to the particulate foam (1) and a further portion of synthetic and/or natural reinforcing fibers comprising sufficient wettability for at least one rigidifying, hardening and/or linked polymer which forms the cover layer (3) and which is disposed in the liquid phase onto the free surface of the mixed fiber layer

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23. Composite material according to claim 22, characterized in that the polymer disposed onto the free surface of the mixed fiber layer is a thermoplastic material.
24. Composite material according to claim 23, characterized in that the polymer disposed onto the free surface of the mixed fiber layer is polyalkylene terephthalate, in particular PET.
25. Composite material according to claim 22, characterized in that the polymer disposed onto the free surface of the mixed fiber layer is an elastomer.
26. Composite material according to claim 22, characterized in that the polymer disposed onto the free surface of the mixed fiber layer is a thermosetting plastic material.
27. Composite material according to any one of the claims 22 through 26, characterized in that the polymer disposed in its liquid phase onto the free surface of the mixed fiber layer is fiber-reinforced.
28. Composite material according to any one of the claims 22 through 27, characterized in that the polymer disposed in the liquid phase onto the free surface of the mixed fiber layer comprises, at least on its visible side, a decorative layer, e.g. a foil, textile or the like.

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29. Composite material according to any one of the claims 6 through 28, characterized in that at least one supporting layer (1) is disposed on a free surface of the particulate foam (2) or within the particulate foam (2).
30. Composite material according to claim 29, characterized in that the supporting layer comprises at least one compact insertion part.
31. Composite material according to claim 29 or 30, characterized in that the supporting layer (1) consists of at least one polymer and is compact.
32. Composite material according to claim 31, characterized in that the supporting layer (1) comprises polyalkylene terephthalate, in particular PET, or is formed exclusively thereof.
33. Composite material according to any one of the claims 28 to 32, characterized in that in that the supporting layer (1) is welded to the particulate foam (2).
34. Composite material according to any one of the claims 6 through 33, characterized in that several layers are provided, in particular in the form of sandwiches, at least one of which is a particulate foam (2) of polyalkylene terephthalate, in particular PET.

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35. Molded part (5a,5b) of a composite material in accordance with any one of the claims 6 through 33.

36. The use of a molded part in accordance with claim 35 for inner linings or as technical structural parts for automotive vehicles.

37. The use of a molded part in accordance with claim 35 for furniture, in particular garden furniture.

38. The use of a molded part in accordance with claim 35 for sports devices, such as surf boards, wave sliders, hulls or the like.

39. The use of a molded part in accordance with claim 35 for packings, insulation containers or housings.

40. Method for producing a molded part (5a,5b) from a composite material according to any one of the claims 6 through 34, characterized in that particles of foamed polyalkylene terephthalate, and/or pre-foamed polyalkylene terephthalate containing a foaming agent, with a low crystallite portion in an otherwise amorphous phase, are heated in a mold to a temperature at which the surface of the particles melts and connect to one another to form the molded body, and after cooling, at least one layer, e.g. a cover layer (3) is laminated onto a free surface of the particulate foam molded body, and that the particulate

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foam molded body is tempered through appropriate temperature control during production and/or cooling.

41. Method according to claim 40, characterized in that the particles are brought to a temperature at which the surface of the particles melts in the presence of an intermediate layer (4) containing polyalkylene terephthalate, and the intermediate layer (4) is back-foamed, the composite obtained is cooled and the cover layer (3) is subsequently laminated onto the intermediate layer (4).

42. Method for producing a molded part (5a, 5b) from a composite material in accordance with any one of the claims 6 through 34, characterized in that at least one layer, e.g. a cover layer, and densely packed particles of foamed, and/or pre-foamed polyalkylene terephthalate containing a foaming agent, are heated in a mold to a temperature at which at least the surface of the particles melts, the cover layer (3) is back-foamed, the composite material is subsequently cooled, and the particulate foam molded body is tempered by appropriate temperature control during production and/or during cooling.

43. Method according to claim 42, characterized in that an intermediate layer (4) is disposed between the particles and the cover layer (3) and the intermediate layer (4) is welded to both the cover layer (3) as well as to the particulate foam (2) via back-foaming thereof.



44. Method for the production of a molded part from a composite material in accordance with any one of the claims 5 through 34, characterized in that an intermediate layer (4) in the form of a mixed fiber layer (2) having a portion of fibers of polyalkylene terephthalate, in particular PET, and a further portion of reinforcing fibers having sufficient wettability for a liquid-phase polymer forming the cover layer, and densely packed particles of foamed polyalkylene terephthalate, and/or pre-foamed polyalkylene terephthalate containing at least one foaming agent, are heated in a mold to a temperature at which the surface of the particles and the polyalkylene terephthalate fibers of the mixed fiber layer melt, the obtained composite is subsequently cooled and then, the rigidifying, hardening and/or linked liquid-phase polymer in the liquid phase is disposed onto the free surface of the mixed fiber layer, wherein the particulate foamed molded body is tempered through appropriate temperature control during its production and/or during cooling.

45. Method according to claim 44, characterized in that the rigidifying, hardening and/or linked liquid-phase polymer is mixed with synthetic and/or natural reinforcing fibers and subsequently disposed onto the free surface of the mixed fiber layer.

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46. Method according to claim 44 and 45, characterized in that a decorative layer, e.g. a foil, textile or the like is disposed onto the visible side of the polymer disposed in the liquid phase.
47. Method according to claim 46, characterized in that the decorative layer is disposed onto the mixed fiber layer together with the polymer by injection, pressing or the like.
48. Method according to any one of the claims 40 through 47, characterized in that the particles are heated in the mold in the presence of a compact support layer (1), in particular, of at least one polymer, to a temperature at which at least the surface of the particles melts, wherein foam is disposed behind or around the supporting layer (1).
49. Method according to any one of the claims 40 through 48, characterized in that the particles and optionally the cover layer (3) and/or the intermediate layer (4) are heated to the melting temperature by a hot gas phase which diffuses through them.
50. Method according to any one of the claims 40 through 48, characterized in that the particles and optionally the cover layer (3) and/or the intermediate layer (4) and/or the supporting layer (1) are heated to the melting temperature by means of microwave energy.

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51. Method according to claim 50, characterized in that a medium is used which absorbs microwaves.

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